Table S1: Sample-measurement details

Sample number	TUCNL	AMS ID	Quartz (g)	Carbon yield (μg)	Carbon-yield uncertainty (μg)	Diluted carbon (μg)	$^{14}C/^{13}C$	$^{14}C/^{13}C$ uncertainty	$\delta^{13}C$ (per mille)	$^{14}C/C_{total}$	$^{14}C/C_{total}$ uncertainty
GR01	761	OS-163393	.6034	3.4	0.04	115.3	1.98E-12	5.83E-14	-2.69	1.90E-14	5.59E-16
GR03	762	OS-163394	5.01112	21.1	0.3	115	2.33E-12	2.77E-13	-4.17	2.53E-13	3.01E-15
GR04	763	OS-163397	5.3835	66	0.8	116.6	4.65E-11	2.04E-13	-5.04	5.08E-13	2.24E-15
GR06	764	OS-163398	5.186	35	0.4	115.6	5.17E-11	2.04E-13	-5.56	5.65E-13	2.24E-15
GR07	723	OS-161685	1.1181	7.4	0.1	113.6	1.56E-11	7.29E-14	-4.58	1.68E-13	7.89E-16
GR12(BR)	724	OS-161686	2.4832	10.1	0.1	115	5.64E-12	4.37E-14	-4.28	5.91E-14	4.59E-16
GR13	765	OS-167939	5.2367	23.6	0.3	114.4	1.44E-11	1.02E-13	-3.92	1.55E-13	1.10E-15
GR15(BR)	735	OS-162192	5.0494	35.5	0.5	116	2.32E-12	5.83E-14	-6.00	2.27E-14	5.71E-16
GR18	725	OS-161687	5.1754	25	0.3	115.7	4.56E-11	1.75E-13	-4.60	4.98E-13	1.92E-15
GR21(BR)	741	OS-162198	5.2501	41.2	0.5	116	6.51E-11	3.06E-13	-4.88	7.12E-13	3.36E-15

Table of sample-measurement details. All sample concentrations corrected by subtracting a 0.58 ± 0.31 x 10^4 atom blank. Where the 1 σ [^{14}C] uncertainty and 6% [^{14}C] uncertainty differ, the larger uncertainty value is used. "Internal" ^{14}C-age uncertainty includes only instrumental uncertainty. "External" ^{14}C-age uncertainty includes both instrumental and production-rate uncertainties. All Al and Be data from Lilly (2008; PhD thesis) and Lilly *et al*. (2010).

Table S1: Sample-measurement details (continued)

Blank-corrected total $^{14}C^*$ (10^4 atoms)	Blank-corrected total-^{14}C uncertainty (10^3 atoms)	$[^{14}C]$ (10^5 atoms/g)	1σ $[^{14}C]$ uncertainty (10^3 atoms/g)	6% $[^{14}C]$ uncertainty (10^3 atoms/g)	^{14}C Age (ka)	Internal ^{14}C-age uncertainty (ka)	External ^{14}C-age uncertainty (ka)	Effective-blank proportion of total ^{14}C (%)	$^{10}Be/^9Be$ ratio (10^{-15})	$^{10}Be/^9Be$-ratio uncertainty (%)
5.2	4.70	0.86	7.79	5.16	1.006	0.097	0.098	52.8	1,585 ± 64	4
140.0	25.69	2.8	5.13	16.8	3.983	0.308	0.32	4.0	16,303	0.9
291.3	40.35	5.41	7.5	32.46	11.004	1.387	1.442	2.0	12,062 ± 142	1.2
321.5	43.98	6.2	8.48	37.2	14.615	2.425	2.521	1.8	2,812 ± 50	1.8
90.0	13.44	8.05	12.02	48.3	Saturated	N/A	N/A	6.1	25,652 ± 348	1.4
28.3	5.98	1.14	2.41	6.84	1.371	0.09	0.093	17.1	7,650 ± 100	1.3
83.2	13.39	1.59	2.56	9.54	1.989	0.135	0.141	6.6	1,681 ± 22	1.3
7.4	4.85	0.15	0.96	0.9	0.019	0.013	0.013	44.0	8,746 ± 127	1.4
282.9	38.74	5.47	7.48	32.82	11.6	1.53	1.59	2.1	9.037 ± 85	0.9
408.5	56.63	7.78	10.79	46.68	Saturated	N/A	N/A	1.4	21,477 ± 250	1.2

Table of sample-measurement details (continued).

21 **Table S1: Sample-measurement details (continued)**

$[^{10}Be]$ (10^6 atoms [g quartz]$^{-1}$)	$[^{10}Be]$ uncertainty (%)	$^{26}Al/^{27}Al$ ratio (10^{-15})	$^{26}Al/^{27}Al$-ratio uncertainty (%)	$[^{26}Al]$ (10^6 atoms [g quartz]$^{-1}$)	$[^{26}Al]$ uncertainty (%)
1.53 ± 0.07	4.5	2,060 ± 84	4.1	7.2 ± 1.5	2.0
7.44 ± 0.16	2.2	21,317 ± 382	1.8	49.8 ± 3.1	6.3
9.45 ± 0.22	2.3	35,266 ± 431	1.2	50 ± 10	2.0
3.15 ± 0.08	2.7	7,824 ± 199	2.5	15.4 ± 3.1	2.0
17.8 ± 0.4	2.4	51,037 ± 593	1.2	96 ± 19	2.0
8.49 ± 0.20	2.4	24,625 ± 496	2	39.5 ± 1.8	4.5
1.53 ± 0.04	2.4	5,520 ± 267	4.8	10.1 ± 0.6	6.3
11.5 ± 0.3	2.5	30,658 ± 401	1.3	54.0 ± 2.3	4.2
5.58 ± 0.12	2.2	13,500 ± 398	3	57.8 ± 1.4	5.0
22.6 ± 0.5	2.3	47,386 ± 561	1.2	107 ± 4	4.2

22

23 **Table of sample-measurement details (continued).**

24 **References**

25 Lilly, K.: Three million years of East Antarctic ice sheet history from in situ cosmogenic nuclides in the Lambert-Amery Basin, 2008. 2008.

26 Lilly, K., Fink, D., Fabel, D., and Lambeck, K.: Pleistocene dynamics of the interior East Antarctic ice sheet, Geology, 38, 703-706, 2010.